little, rather dingy, room in which, for well nigh thirty years, he has sat amidst blue-books, calendars, mineralogical specimens, and a rather orderly chaos of miscellaneous objects. They will think with sadness of the rupture of these old associations, and will follow to the grave with deep respect and sincere regret the old friend who has been so suddenly and unexpectedly removed from their midst.

WILLIAM GEORGE VALENTIN

It is with much regret that we record the untimely and sudden death on the 1st inst. from apoplexy of Mr. William George Valentin. He was born in Neuenburg, in the Black Forest, on May 16, 1829. He came to England in 1855, and, in the early days of the Royal College of Chemistry, studied under Dr. Hofmann, who esteemed him greatly, and, recognising his ability, made him senior assistant in the laboratory, a position which he retained at the Science Schools, South Kensington, under Dr. Frankland. He held for some years the office of gas examiner to the Great Western Gas Company, and at the time of his death was chemical adviser to the Trinity House.

His chemical text-books are deservedly popular; and within the last few days he corrected the final proofs of a new work which is therefore nearly ready for publication.

Mr. Valentin was a successful and painstaking teacher, and the fact that so many of the well-known chemists of this generation have received their early training from him, sufficiently indicates the value of his work; it would be difficult, indeed, to find one to whom the younger chemists of the present day are more indebted.

Within the last few weeks a few of his old friends and students of the Royal School of Mines had intended to present him with a testimonial; the efforts of the committee formed for this purpose will now be continued for the benefit of his widow and family.

ELECTRIC LIGHTING

We need not insist on the extreme importance and interest of the exhibition which was opened last night at the Albert Hall, and for which extensive preparations have been making for some time. The public mind both in this country and abroad has been recently much agitated on the question of electric lighting, and, as might be expected, people are much confused among the many systems which have been brought forward, and even those who know something of the subject must find it difficult to make up their minds. Hence the importance of bringing together the various systems of electric lighting in such a way as to make comparison possible. It must, moreover, have an important educational influence upon the general public, helping somewhat to give them a truer idea of what physical science is, and what it is capable of doing for the good of mankind. The exhibition was opened last night by an able and interesting lecture by Mr. W. H. Preece, the chair being occupied by the Prince of Wales.

The machines to be exhibited are not only those which have been recently attracting attention, but also older ones, which will exhibit in an impressive manner the history of the development of electric lighting. Thus there are in the arena of the Albert Hall specimens of Mr. Holmes's original magneto-electric machine, and of the Alliance Company's magneto-electric machine, lent by Trinity House, as well as the Siemens dynamo machine and the Gramme machine, now so much in use for generating electricity for lighting and other purposes. There are also varieties of the Gramme and Siemens machines, differing from each other more in minute detail than in general principle.

The Jablochkoff and the Lontin systems are also strongly represented. From the centre of the dome depend five large lamps of the Siemens pattern, round the upper corridor are ranged the Jablochkoff lamps exhibited by the Société Générale d'Electricité, and around the arena stand handsome specimens of the Lontin lamp, mounted on tastefully-designed posts. The Wilde lamp will also be strongly represented. This may be briefly described as the Jablochkoff candle with the central non-conducting substance left out. In addition to a powerful Gramme machine, the British Electric Light Company exhibit several lamps, notably the Serrin, hardly yet surpassed in some points of excellence, the Werdermann, Reynier, Higgins, and Rapieff lights, and it is stated that the Anglo-American Electric Light Company will exhibit the Wallace and the Iridium Incandescent lights, the last-named of which is of much the same kind as that employed by Mr. Edison. The distinguishing characteristics of these various lights were explained by Mr. W. H. Preece, and the exhibition, which will remain open to the public for the remainder of the week, promises to be by far the most attractive display of scientific apparatus made for some considerable time past.

It may not be inappropriate to give here a short account of a new form of electric lighting, which, it would seem, will not be represented at the exhibition now opened at the Albert Hall.

At last week's meeting of the Paris Academy, M. Jamin presented a model of an electric light for which he claims the greatest possible simplicity. The two carbons are kept parallel by two insulated copper tubes, separated by an interval of two or three millimeters, in which they slide by friction, and which serve at once to direct them and to guide the current. They are surrounded by a directing circuit composed of five or six spirals coiled on a thin rectangular frame ·40 m. long and ·15 m. broad. This circuit, traversed by the same current as the carbons, and in the same direction, guides and fixes the electric arc at the extremity of the points. The lighting is effected automatically. For this purpose, the two extremities of the carbons are surrounded by a thin caoutchouc band which keeps them close together. Between them, a little above, a small fragment of iron wire is introduced, which keeps them in close communication by a single point. As soon as the circuit is closed, the current traverses this wire, makes it red-hot, and melts the caoutchouc; the two carbons, thus freed, separate, and the arc is established with a sort of explosion. Carbons of any size may be employed, up to 8 mm. diameter. At this limit the waste scarcely exceeds ·08 m. per hour. By a proper arrangement the points may be maintained in their initial position. The apparatus may be suspended either with the points upwards or directed towards the ground. For several reasons, which Mr. Jamin states, the latter position is preferable. With its points downwards, then, M. Jamin claims for his light the following advantages:—1. That of simplicity, since it requires no mechanism and no preliminary preparation; all is reduced to a support and to carbons; (2) that of mechanical economy, since it succeeds in almost doubling the number of lights; (3) increase of illumination, since each of the new lights is nearly twice as powerful as the old; (4) quality of light, which is more white; (5) a more advantageous arrangement of the poles, which throw their greatest amount of light downwards, where it is required, instead of losing it towards the sky, where it is useless; (6) finally, economy of the combustible material, since the waste is less in proportion to the size of the carbons.

NOTES

We greatly regret to announce the death at Rome, on April 14, of Prof. Paolo Volpicelli, the well-known Italian electrician. We hope to be able to give details of his life and work in an early number.

THE Council of the Society of Arts have awarded to Sir William George Armstrong, C.B., D.C.L., F.R.S., the Albert Medal "because of his distinction as an engineer and as a scientific man, and because by the development of the transmission of power, hydraulically, due to his constant efforts, extending over many years, the manufactures of this country have been greatly aided and mechanical power beneficially substituted for most laborious and injurious manual labour."

THE annual *conversazione* of the president of the Institution of Civil Engineers has been announced for Monday, May 26. Mr. Bateman, the president, will, by permission of the Lords of the Committee of Council on Education, receive his guests in those galleries belonging to the South Kensington Museum which contain the varied and extensive collection of engineering, naval models, drawing instruments, and machinery. Mr. Bateman invites the members of the profession and others to supplement that collection by the loan for the occasion in question of any similar suitable object.

THE *American Naturalist* states positively that the President has nominated Mr. Clarence King to the directorship of the U.S. Geological Survey, and from an article by Mr. A. S. Packard, in the same number, there seems no doubt that the appointment has been confirmed. The actual state of matters now is that the three surveys under Hayden, Powell, and Wheeler are to be discontinued after June 30, and to be replaced by a new U.S. Geological Survey, in charge of Mr. Clarence King. "It was," Mr. Packard states, "as far as we are aware, the original understanding, when the matter was referred by Congress to the National Academy of Sciences, to simply consolidate the existing geological surveys, but the report of the committee was so worded that these surveys were abolished outright instead of being consolidated. The amount appropriated for the new geological survey is 100,000 dollars, a little more than each of the other surveys has formerly received. Thus the work is apparently to be greatly curtailed, and science and the best interests of the Western people will, in a corresponding degree, suffer." We trust that this is too gloomy a view to take of the prospects of the newly-organised survey, though we fear that personal interests have had more weight in bringing about the new state of things than the interests of science of the United States. We understand from Mr. Packard that no provision has been made for carrying on biological observation along with the geological survey, a department hitherto admirably represented, and the work of which has made the U.S. Survey famous all the world over. We are sure it will not be with Mr. King's consent that zoology and botany will be ignored in the survey under his charge, and he may be sure that men of science of all nations will watch with interest the future work of that survey which hitherto has contributed so largely to scientific knowledge.

THE death is announced of Mr. Frank A. Bradley, a well-known American geologist; he was crushed to death by the caving of a wall of a gold mine in Georgia.

THE United States Congress has appropriated 10,000 dollars for the completion of the investigation of the Rocky Mountains by the United States Entomological Commission. The work during the coming season will be carried on in Colorado and the Western Territories, particularly Utah and Eastern Idaho.

MR. S. H. BRACKETT, of St. Johnsburg Academy, Vermont, writes to the *Scientific American*, claiming for Mr. Edward Farrar, of Keene, N.H., the discovery of the principle of the telephone in 1851. In support of the claim Mr. Brackett gives the following extracts from Mr. Farrar's correspondence of the time:—"Each reed of a melodeon is furnished with a small metallic point, which, while the reed is at rest, approaches near to the surface of mercury in a very small cup underneath the reed, into which the point dips when set in motion. The reeds are connected with one pole of a battery, and the cups with the other. The current is broken with each vibration of the reed. At the remote end of the wire is a temporary magnet, with an armature fixed upon a spring in near proximity to the magnet, and which is affected as a reed at the other end of the line is set in motion. The effect is that the armature vibrates with the reed set in motion, and, the pitch of a sound depending on the rapidity of vibration, it will be the same in the reed and armature. A tune on the instrument will therefore produce a tune on the armature. What may appear somewhat strange, several different tones may be heard when chords are struck upon the instrument. The object of my inquiry was this: *If the current power could be varied by some slight variation of a vibrator to be affected by the atmosphere as the tympanum of the ear is, the supposition is that the sounds of the voice might be reproduced* by the means stated above." When it is remembered that Mr. Farrar penned the above in May, 1854, it is to be regretted, we agree with Mr. Brackett, that he was turned aside from so interesting an inquiry at so critical a point.

THE chief work now in process of publication by the United States Geological Survey, we learn from *Science News*, is Dr. Joseph Leidy's "Monograph of the Fresh-water Rhizopods of North America." It will form a quarto volume of several hundred pages, enriched by numerous plates, and will be the twelfth of the series of "Final Reports." The author has been long engaged upon this book, and brings to the elucidation of this subject unequalled knowledge of the branch of which he treats. The introductory chapter furnishes a general account of the rhizopods, giving the characteristics which serve to identify them, telling where they dwell, how they live, in what way to catch them, and the proper method for studying them under the microscope and otherwise. The class Rhizopoda, Dr. Leidy separates into five orders, as follows: Protoplasta, Heliozoa, Radiolaria, Foraminifera, and Monera. Dr. Leidy confines himself to those species which inhabit American ponds and rivers.

THE following questions are proposed by the Belgian Academy for competitive treatment (the rewards offered being medals of 800 francs value each, except for the third of the first section, where the value is raised to 1,000 francs):—I. Section of Mathematical and Physical Sciences—1. Show the state of our knowledge of phenomena known under the name of *influence of masses*, and indicate why the ideas of Berthelot have yielded to those of Proust; also indicate, if possible, the way by which a solution of the general problem may be arrived at. 2. Find and discuss the equations of some algebraic surfaces of no mean curvature. 3. Complete, by new experiments, the state of our knowledge of the relations which exist between the physical and the chemical properties of simple and of compound substances. II. Section of Natural Sciences—1. Give a description of the tertiary strata belonging to the eocene series, that is to say, terminated superiorly by the Laekenian system of Dumont, and situated in Hesbaye, Brabant, and Flanders. 2. Describe the history of the germinative vesicle in ova capable of developing by parthenogenesis. (The author is free to choose any animal species in which parthenogenetic development has been proved to exist.) 3. New observations on the relations of the pollinic tube with the ovule, in one or more phanerogams. The memoirs to be clearly written in French, Flemish, or Latin, and sent, with motto and sealed packet, to the secretary, before August 1, 1880. Great exactness required in citations. Two questions are also proposed for 1881:—1. New researches on the germination of seeds, especially on the assimilation of nutritive deposits by the embryo. 2. Extend to eight points of a curve of the third order, the enharmonic property of four points of a conic.

The Carpi prize of the Reale Academie de' Lincei for 1880 (value 500 lire) will be awarded to the author of the best monograph *On the Organs and Vital Functions of Plants.* Memoirs to be sent in before December 31, 1880. The conditions are the same as in 1878.

A new nautical instrument, called a *navisphere*, has been brought before the French Academy by M. De Magnac. It is meant to indicate, without calculation and promptly, the names of the stars above the horizon at a given moment (with altitude and azimuth), the angle of route for going from one point to another by the arc of a great circle, and the distance between these points (approximately). Spherical triangles may also be solved with it. The instrument consists of two parts, the one a celestial sphere with stars marked on it, resting on a spherical zone, to which all possible positions may be given; the other comprises the system of the horizon, the meridian, and the vertical, represented by a circle, a semicircle, and a quarter of a circle in metal. With this system of arcs one can trace arcs of a great circle on the sphere, and measure their lengths, also measure the angles formed by two great circles. The second part of the apparatus is called a *metrosphere.* The experiments with the *navisphere*, made on board the Atlantic steamship *Washington* appear to have been highly encouraging.

In the spectral examination of the new earth recently extracted from erbine by M. Nilson, M. Thalén found the following lines proper to the spectrum of that substance. (*Comptes Rendus*, March 24.)

Colour of rays.	Wave-length.	Intensity.	Remarks.
Orange	6078·5	3	Broad and nebulous.
	6072·5	3	
	6054·0	5	Nebulous.
	6035·0	2	
	6019·0	4	Nebulous.
Yellow	5736·0	6	
	5729·0	6	
	5719·0	4	Very fine and clear.
	5710·5	4	
	5700·0	4	
	5686·0	4	
	5671·0	4	
	5657·5	4	
	5526·0	2	Strong.
Green	5089·0	6	Fine.
	5084·5	5	
	5082·3	4	
	5081·0	3	
	5030·0	3	
Blue	4742·5	3	
	4739·0	4	
	4736 5	5	
	4733·0	5	
Indigo	4404·0	„	
	4373·0	„	
	4323·0	„	
	4319·0	„	
	4313·0	„	
	4245·5	„	

Besides these lines, several others were observed which belong to the spectrum of ytterbium, and which have already been indicated by M. Höglund in the spectrum of erbium. For the new element M. Nilson proposes the name *scandium*, to denote its peculiarly Scandinavian origin.

The International Congress of Americanists has issued its circular of invitations to a third session, to be held at Brussels from September 23 to 26, under the patronage of the King of Belgium and the presidency of the Count of Flanders. The city of Brussels will take charge of the Congress, and see to the proper accommodation and convenience of the members. The object of this organisation is the development of a knowledge of the early history of discovery and settlement in the Americas, as also all such facts in their prehistory as can be gathered by an inspection of the remaining monuments. The volumes of *Proceedings* contain a great deal of interesting and important matter, although the Society is rather open to the charge of credulity in accepting, apparently without question, many statements repudiated by American archæologists. This, however, would be remedied by a larger representation from North America; and it is much to be hoped that some of our more accomplished American historians and ethnologists may take part in the proceedings of the coming season.

It is known that the first aërial voyage was made by Pilatre de Rozier, in company with the Marquis d'Arlandes, in a Montgolfiere, or heated air balloon, on November 21, 1783. Pilatre was also the first victim of aërostation; he perished along with his companion Romain by the fall of a balloon at Boulogne. Three pieces which belonged to the unfortunate physicist are exhibited in the museum there: his speaking-trumpet, mercury barometer, and thermometer. Recently some other precious relics from the same origin have been found in a drawer in the museum. They are chiefly a plaster medallion of Pilatre, a part of the painted cloth which covered the gallery of the balloon, and the flagstaff. Engravings of these and the former relics of Pilatre are given in a recent number of *La Nature* (April 26), which also reproduces a detailed account of the fatal ascent.

The extent of variability in composition of atmospheric air is a question treated by Herr von Jolly in a recent communication to the Bavarian Academy. By two methods of measurement, the one eudiometric, the other based on weighing, he observed variations that are not quite inconsiderable. The air samples of the year 1877 (got 2 km. out of town) showed differences in the oxygen from 21·01 down to 20·53 per cent., and in 1875 to 1876 the highest and lowest proportions (obtained by weighing) were 20·96 and 20·47 per cent. respectively. The variations in the two years were thus nearly the same. The largest amount of oxygen occurred in both years when the polar current was prevalent; the smallest with the equatorial current or föhn. It is not affirmed, however, that whenever the wind is north or north-east, there is necessarily *more* oxygen, and when it is south and south-west, *less*; or that differences of 0·5 per cent. occur with every reversal of the wind. The more rapidly the directions of wind alternate, there is more mixture of air masses; and therefore there is never so much oxygen as with continuous polar current, or so little as with continuous equatorial. Whether from year to year the mean proportion of oxygen is the same, or whether, as is more probable (the duration of polar and equatorial currents varying from year to year), there are slight differences in this average, can only be determined by further observations.

During the conjunction of the planets Mercury and Venus, on September 30 last year, measurements of their relative power of light-reflection were made at Strasburg Observatory (we learn from *Astr. Nachr.*) by Herr Schnur. The half-objective of the telescope which showed Venus was gradually shaded by measurable quantities till equal surface-portions of Venus appeared of the same brightness as those of Mercury through the unshaded part. The measurements on September 30 gave for relative light intensity the value 6·75, and on October 2 the value 5·36; the latter figure is considered the more reliable, and may be accepted for the relative brightness of Mercury and Venus. Herr Zöllner, by a quite different method, got 5·5.

Applications for the intended Exhibition of Applied Science in Paris may be sent to M. Nicolle, director, 10, rue de Lancry, Paris. The presidency of the Patronage Committee has been accepted by M. Jules Simon. More than 200 English firms have already sent in their adhesion, and more than 300 German firms wish to protest against the abstention imposed by their own Government in 1878. A large number of these belong to

Alsace-Lorraine. The exhibition will keep open from July 15 to the end of November, but a limit will be imposed on exhibitors sending in their applications.

On April 27 an earthquake was felt at Florence, and also at Bologna. The Florence commotion was very slight, but had been preceded by other movements of a similar nature, which ought not to pass unnoticed, especially in connection with the seismic manifestations felt in Germany, as mentioned in our last impression.

Mr. Rowland Ward writing to the *Standard*, states that in making the excavation at Charing Cross for Messrs. Drummonds' new bank, the workmen, at depths varying from fifteen to thirty feet, came upon the fossil remains of various extinct animals. They include elephant tusks and molars (probably the mammoth *Elephas primigenius*), teeth and numerous bones of the gigantic extinct ox (*Bos primigenius*), a portion of the horn of the great extinct Irish deer (*Megaceros hibernicus*), along with various other remains of ruminating animals not yet identified. The specimen in this series which has specially attracted notice is the extreme end of a tusk unusually sharp at the point and highly polished, and from a portion of the surface of which a very thin skin of ivory peels off, exposing a strongly and regularly longitudinally channelled surface beneath.

Mr. Watson Lyall's "Sportsman's and Tourist's Guide" improves every year. It has now reached its seventh year, and is evidently a great success. The information as to shootings, rivers, lochs, &c., of Scotland is as full as could be, and is evidently kept well up to date. It deserves all the success it has obtained. In this connection we greatly regret to see that the disease which we referred to last year as having broken out among the Solway salmon has reappeared this year, not only in the Solway rivers, but in the Tweed. Mr. Sterling, of the Edinburgh Anatomical Museum, found it to be a branching fungus (*Saprolegnia ferax*), which, first attacking the scaleless parts, rapidly spreads over the whole fish. The disease has not yet appeared north of the Tweed. Sir Robert Christison recommends a Royal Commission, and the careful watching of all salmon and trout streams, whether affected or not.

We are glad to see from its Twenty-first Report that the East Kent Natural History Society is fulfilling its functions, though under many disadvantages.

We have already referred to the forthcoming annual meeting, at Leicester, of the Midland Union of Natural History Societies. Those interested in the meeting will find further details in our advertisement columns.

In Prof. Jevons's article (vol. xix. p. 588), second column, line 18, for "a seer is equal to about 21 lb. avoirdupois," read "a seer is equal to about 2 lb. avoirdupois." The error is a purely typographical one, and does not affect any other statements in the article. Mr. E. H. Pringle asks us to state that in his letter (vol. xx. p. 6), "such distances as six," &c., should be "such heights as six," &c., and "mountain 20,000 feet high (less than 4 miles)" should be "mountain 10,000 feet high (less than 2 miles)." He thinks it may be worth mentioning that Raoul or Sunday Island, in the Kermadecs, has an elevation of 1,627 feet, commanding a sea horizon of nearly 50 miles radius.

The additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus radiatus*) from India, presented by Mr. E. Brett; a Pig-tailed Monkey (*Macacus nemestrinus*), from Java, presented by Mr. E. M. Clissold; a Black-faced Spider Monkey (*Ateles ater*) from Eastern Peru, two Passerine Ground Doves (*Chamæpelia passerina*) from America, presented by Capt. H. King; an Ocelot (*Felis pardalis*) from America, presented by Mr. B. H. Jones; a Crab-eating Raccoon (*Procyon cancrivorus*) from South America, presented by Mr. Bridget; a Long-tailed Marmot (*Arctomys caudata*) from Bhootan, presented by Capt. Greenstreet, R.E.; a Silver Pheasant (*Euplocamus nycthemerus*) from China, presented by Mr. E. J. Beagle; a Small Hill Mynah (*Gracula religiosa*) from South India, presented by Mr. J. W. Wodler; five Water Ouzels (*Cinclus aquaticus*), British Isles, presented by Mr. F. Swabey; an Anaconda (*Eunectes murinus*) from South America, presented by Mr. G. H. Hawtayne, C.M.Z.S.; a Teguexin Lizard (*Teius teguexin*) from South America, a Leopard Tortoise (*Testudo pardalis*) from South Africa, purchased; a Tamandua Ant-eater (*Tamandua tetradactyla*) from South America, a Great American Egret (*Ardea egretta*) from America, deposited; a Reeves's Muntjac (*Cervulus reevesi*) born in the Gardens.

RECENT CONTRIBUTIONS TO THE HISTORY OF DETONATING AGENTS[1]

II.

That the power possessed by different very highly explosive substances, of inducing the detonation of such bodies as gun-cotton and nitro-glycerine, is not solely ascribable to the operation of mechanical force very suddenly developed, is indicated not only by the singular inertness of gun-cotton to the influence of nitro-glycerine as a detonating agent, but also by a comparison of the behaviour of other detonating substances with that of the mercuric fulminate, when applied to the detonation of gun-cotton. Thus the detonation of silver fulminate is very decidedly sharper than that of the mercury compound, yet it is in no way superior to the latter in its power as an initiative detonating agent; indeed, a somewhat larger amount of it appeared to be required than of the mercury salt to induce detonation of gun-cotton with certainty. Again, the iodide and chloride of nitrogen are far more susceptible of sudden detonation than the silver fulminate; yet while 5 grains of the latter, confined in a stout metal envelope, suffice to detonate gun-cotton, 50 grains of chloride of nitrogen confined by water, appeared to be the minimum amount with which the detonation of gun-cotton could be accomplished with certainty, while no success attended the employment of confined iodide of nitrogen in quantities ranging up to 100 grains.

The incompatibility of these results with the general conclusion, based upon numerous and greatly varied experiments, that the facility with which the detonation of gun-cotton and nitro-glycerine, and bodies of a similar character as explosives, is induced by an initiative detonation, is proportionate to the mechanical force aided by the heat developed by the latter, led the lecturer to the conclusion that a synchronism or similarity in character or quality of the vibrations developed by the detonation of particular substances, operates in favouring the detonation of one such substance by the initiative detonation of a small quantity of another, while in the absence of such synchronism, a much more powerful detonation, or the application of much greater force, would be needed to effect the detonation of the material operated upon. This view has received considerable support from results since obtained by other experimenters, especially by MM. Champion and Pellet; but the subject is one which still needs further experimental elucidation.

The physical character of explosive substances, as also the mechanical condition of a mass of the particular explosive substance operated on, are of great influence in determining its behaviour when submitted to the action of an initiative detonation. The liquid nitro-glycerine is far more sensitive to detonation than gun-cotton; one grain of mercuric fulminate, confined in a metal case, suffices to detonate nitro-glycerine when surrounded by it; but, in order to attain this result with any degree of certainty, it is necessary so to confine the nitro-glycerine as to prevent its yielding to the blow developed by the initiative detonation, and thus to some extent escaping from the operation of the sudden concussion to which the particles contiguous to the fulminate charge are submitted.

If nitro-glycerine be mixed with solid substances in a fine state of division, plastic mixtures may be obtained, and the liquid may thus be presented in something like a solid form to the

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[1] Weekly Evening Lecture at the Royal Institution, Friday, March 21, 1879. By Professor Abel, C.B., F.R.S. Revised by the Author. Continued from p. 21.